EXACTECH| **EXTREMITIES**

Operative Technique





Metatarsophalangeal Arthrodesis



TABLE OF CONTENTS

INTRODUCTION	1
OPERATIVE TECHNIQUE OVERVIEW	2
DETAILED OPERATIVE TECHNIQUE	5
INSTRUMENT & IMPLANT LISTING	16
INDICATIONS FOR USE	21

INTRODUCTION

EPIC Extremity foot and ankle reconstruction system allows surgeons the ability to configure trays for their specific needs through a modular implant and instrument tray design. The connect and disconnect modules easily allow surgeons to mix and match screws and plates based on implant preferences and surgical needs. The system consists of multiple plate families of different anatomical sizes and shapes, 2.7mm and 3.5mm locking and non-locking screws that mate into the plates and various instruments. All implants are made from titanium alloy (Ti6Al4V) conforming to ASTM F136.

Similarly, the EPIC Extremity ankle fracture module consists of various anatomic plate families, 4.0mm non-locking screws, as well as various instruments to assist in implanting the system. The system is also designed to accept the 2.7mm/3.5mm locking and non-locking screws and various instruments from the EPIC Extremity foot and ankle reconstruction system. All implants are made from titanium alloy (Ti6Al4V) conforming to ASTM F136.

In this specific technique, we outline how to perform an MTP Fusion using a plate and lag screw construct, however the basic technique described can be used for all plates for different applications.

The EPIC Extremity foot and ankle reconstruction system is designed in conjunction with:

- Stephen Conti, MD University of Pittsburgh Medical Center
- Gerard Cush, MD Geisinger Musculoskeletal Institute
- Robert Santrock, MD West Virginia University School of Medicine

OPERATIVE TECHNIQUE OVERVIEW

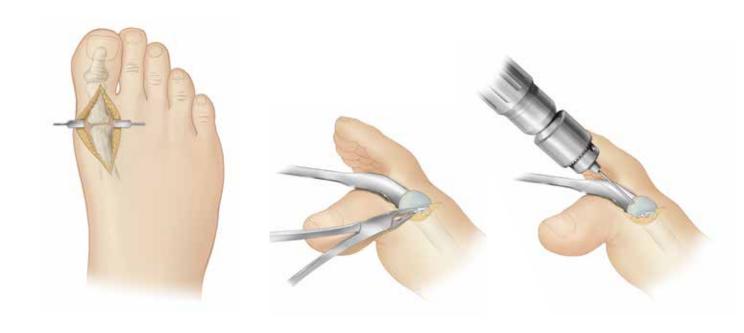


Figure AMake an Incision
Using a Dorsal Approach

Figure BRemove Osteophytes

Figure C
Place the 1.6mm Guidewire
Into the Metatarsal Head

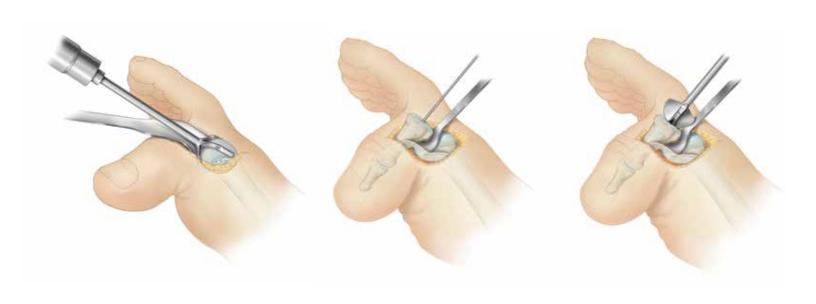


Figure D
Prepare the Metatarsal

Figure E
Place the 1.6mm Guidewire Into
the Phalanx

Figure FPrepare the Phalanx

OPERATIVE TECHNIQUE OVERVIEW

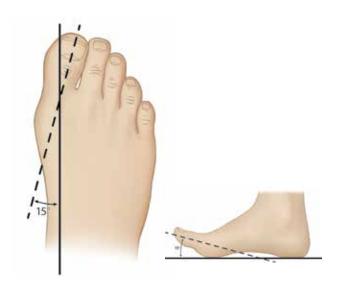


Figure GVerify Joint Articulation



Figure H
Place the 1.1mm K-wire
Across the Joint



Figure I
Place the Cannulated
Depth Guide



Figure JDrill Four Cortices



Figure KCountersink the Proximal Cortex

OPERATIVE TECHNIQUE OVERVIEW



Figure LInsert the Lag Screw



Figure M
Smooth the Dorsal Bone with Oscillating Saw



Figure N
Place a Great Toe
Arthritis Plate



Figure 0
Place the Olive Pins





Figure PDrill the Screw Hole



Figure R Insert All Screws



Figure 1

Make an Incision Using a Dorsal Approach



Figure 2
Remove Osteophytes

Use a Dorsal Approach

Using a dorsal approach, a 5-7cm incision is made longitudinally through the skin and subcutaneous layer 3mm medially to the extensor hallucis longus tendon (EHL) (Figure 1).

The bony anatomy is exposed by incising the capsule in line with the longitudinal incision, retracting the EHL laterally. Dissection is carried medially and laterally to release the collateral ligaments. Plantarflex the phalanx to ensure dissection gives sufficient exposure to both sides of the joint. If needed, extend dissection further medially and laterally.

Prepare the Metatarsal

Remove metatarsal and phalangeal osteophytes with a rongeur. Use the **MTPJ Retractor** to retract the proximal phalanx inferiorly (*Figure 2*).

SURGICAL APPROACH

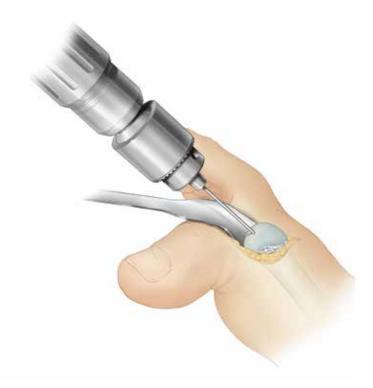




Figure 3
Place the 1.6mm Guidewire Into the Metatarsal Head

Figure 4Prepare the Metatarsal

Place a **1.6mm Guidewire** down the center of the distal metatarsal with a slight dorsal and medial inclination to a depth of approximately half the length of the metatarsal (Figure 3).



Take fluoroscopic images to confirm the guidewire position through the center of the metatarsal.

Estimate the reamer size using the Cone Reamer compared to the metatarsal head. The correctly-sized Cone Reamer will be the smallest size that is able to fit all the way around the metatarsal head.

Place the appropriately-sized Cone Reamer over the guidewire and ream using power until all the cartilage is removed, and the bleeding subchondral bone is visible. Be sure to start the reamer prior to contacting the bone and to protect the skin with general operating room retractors (*Figure 4*).

Be sure to remove the ridge formed around the metatarsal head after reaming. Remove as little bone as possible while still achieving a smooth surface, to reduce excessive shortening of the hallux.

A guidewire can be used to perforate the metatarsal head.

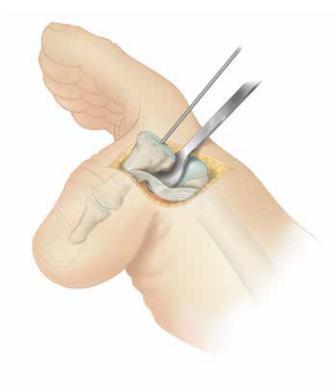


Figure 5
Place the 1.6mm Guidewire Into the Phalanx

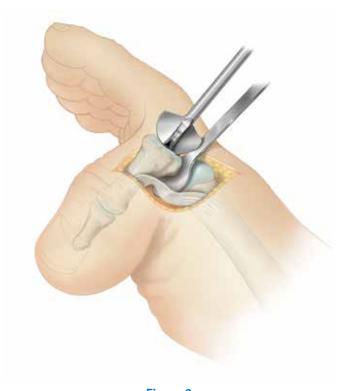


Figure 6Prepare the Phalanx

Prepare the Phalanx

Plantarflex the phalanx and sharply release the plantar soft tissue attachments, then place the smaller end of the **Spoon Retractor** under the phalanx. Place a **1.6mm Guidewire** down the center of the proximal phalanx, following the shaft of the bone to a depth of approximately half the length of the phalanx (*Figure 5*).

Note: The guidewire position is not necessarily perpendicular to the articular surface.



Take fluoroscopic images to confirm guidewire position through the center of the phalanx.

Place the **Cup Reamer** of the same size as the previously used **Cone Reamer** over the guidewire and ream using power until all the cartilage is removed, and the bleeding subchondral bone is visible. Be sure to start the reamer prior to contacting the bone. Care should be taken to remove as little bone as possible while still achieving a smooth surface (*Figure 6*).

A guidewire may be used to perforate the base of the phalanx. Bone graft can be used based on surgeon preference.

SURGICAL APPROACH





Figure 7
Postion the Toe

Insert the Lag Screw

Check to ensure that the joint articulates freely, indicating that the surfaces are smooth and will be in proper contact when the joint is reduced. Place the plantar face of the foot against a flat surface to position the joint. Position the phalanx in a dorsiflexed and valgus position relative to the flat surface to assist with gait. Our design team recommends approximately 10-15 degrees dorsiflexion and 10-15 degrees valgus (Figure 7). Once proper joint position is achieved, place a provisional **1.6mm Guidewire** across the joint.

Decision Point: Depending on bone shape and bone stock, a **3.0mm Lag Screw** may be placed from proximal to distal or distal to proximal.

SURGICAL APPROACH



Figure 8
Place 1.1mm K-wire Across the Joint



Figure 9
Place the Cannulated Depth Guide

After determining which method will be used, place the **1.1mm Guidewire** either from the metatarsal head-neck junction into the plantar-lateral proximal phalanx or from the medial aspect of the phalangeal base-shaft junction to the plantar-lateral metatarsal (Figure 8).

Once the desired joint and guidewire position is achieved, the **Cannulated Depth Guide** can be placed over the guidewire and placed down to the bone (*Figure 9*).

The position of the proximal end of the guidewire within the Cannulated Depth Guide will indicate the length of screw needed.

Note: Care should be taken to make sure that the screw is placed long enough so that the threads cross the fusion site.

SURGICAL APPROACH



Figure 10
Drill Four Cortices



Figure 11
Countersink the Proximal Cortex

Place the **2.2mm Drill Bit** over the guidewire and drill across all four cortices (*Figure 10*).

Countersink the Proximal Cortex

Place the 3.0/3.5 Headed Countersink over the guidewire, and countersink the proximal cortex by hand ,as needed, to reduce screw head prominence (*Figure 11*).

SURGICAL APPROACH







Figure 13
Smooth the Bone with Oscillating Saw

Insert the Lag Screw

Place a 3.0mm Headed Screw of the determined length over the guidewire (Figure 12). Advance into the bone, tightening by hand with the screwdriver, so that the surgeon can assess the bone quality and compression achieved by fully seating the screw head against the cortical bone.

Note: The cannulated screws and drill bits have corresponding colors to indicate compatibility.

Remove the 1.6mm Guidewire.



Using multiplanar fluoroscopic images, assess the screw position. Ensure the threads are all in the metatarsal for a distal-to-proximal screw or in the phalanx for a proximal-to-distal screw.

To prepare the bone for the **Dorsal Plate**, carefully smooth the dorsal face of the metatarsal and phalanx with a micro-oscillating saw (*Figure 13*).

SURGICAL APPROACH



Figure 14
Place a Great Toe Arthritis Plate

Figure 15
Place the Olive Pins

Place a Great Toe Arthritis Plate

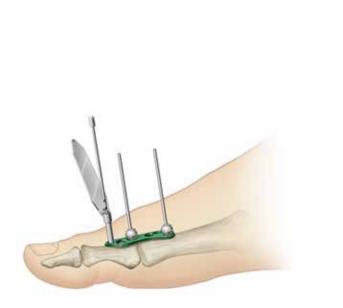
Select a **Great Toe Arthritis Plate** based on patient anatomy and surgeon preference. The recommended technique is to use a plate with a compression slot. The plate bending tool may be used to more accurately match plate contour to patient anatomy (Figure 14).

Note: The Great Toe Arthritis Plates are designed with a curvature, accounting for valgus positioning of the phalanx when the plate is placed with the laser etched dot on the lateral side.

Note: A **2.7mm** and **3.5mm Locking** and **Non-Locking Screws** can be used with any of the plates. It is recommended to use 2.7mm screws, except in the case of poor bone quality or large patients.

Once the compression slot plate is in the desired position with the joint line between the compression slots, place the **Olive Pins** in the compression slot of the phalanx and the proximal threaded hole on the metatarsal to provisionally place the plate (*Figure 15*).

SURGICAL APPROACH



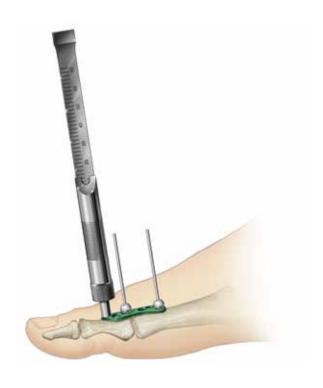


Figure 16
Drill the Screw Hole

Figure 17
Determine the Screw Length

Use a solid drill and drill guide to drill a screw hole across two cortices, under power, through one of the threaded holes on the phalangeal side (*Figure 16*).

Note: The Locking Drill Guide screws into the plate and facilitates a straight hole, whereas using the Double-Ended Drill Guide, a screw can be placed within a 25° degree cone to avoid hardware. The 2.0 Drill is used for the 2.7mm screws, and the 2.7mm Drill Bit is used for the 3.5mm screws. The Double-Ended Drill Guide is labeled to identify which side is used with each drill.

Note: The **Locking** and **Non-Locking Screws** and drill bits have corresponding colors to indicate compatibility.

Use the **Solid Depth Guide** to determine the length of the screw, by extending the tip beyond the second cortex and pulling it back until it catches against the cortex. The screw length is indicated based on the closest graduation to the proximal end of the depth guide body (*Figure 17*).

SURGICAL APPROACH

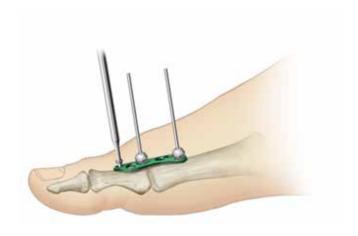


Figure 18
Insert Non-Locking Screws



Figure 19
Insert All Screws

Insert Screws

Insert a Non-Locking Screw by hand using the **Solid T15 Screwdriver** and the **Ratchet Handle**. When using a plate with a compression slot, the hole in the slot used for compression should be drilled through the side of the slot farther from the joint. It is recommended to use the compression slot on the metatarsal side (*Figure 18*).

Drill a hole eccentrically in the compression slot using the **Double-Ended Drill Guide**. The distance of the drilled hole from the distal end of the slot will dictate the amount of compression provided.

Measure the depth of the screw hole.

Place a Non-Locking Screw by hand using the Solid T15 Screwdriver and the Ratchet Handle. The plate will slide proximally upon tightening of the screw.

Remove the Olive Pins.

Repeat the process of drilling, measuring, and placing a Non-Locking Screw on the compression slot. Ensure the Non-Locking Screw is placed toward the proximal end of the phalangeal compression slot.

Repeat the process of drilling, measuring, and placing locking screws on all the remaining threaded holes (Figure 19).



Figure 20Take a Fluoroscopic Image

Take Final Fluoroscopic Image



Take a final fluoroscopic image to confirm correct implant placement (Figure 20).

Close the Incision

Close the incision with sutures based on surgeon's preferred technique.

3.0/3.5 HEADLESS SCREW KIT (KIT-EP_3035)

Im	ni	la i	n	ts
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Catalog Number	Part Description	
1000-3016	Cannulated Screw, 3.0mm x 16mm	
1000-3018	Cannulated Screw, 3.0mm x 18mm	
1000-3020	Cannulated Screw, 3.0mm x 20mm	
1000-3022	Cannulated Screw, 3.0mm x 22mm	
1000-3024	Cannulated Screw, 3.0mm x 24mm	
1000-3026	Cannulated Screw, 3.0mm x 26mm	
1000-3028	Cannulated Screw, 3.0mm x 28mm	
1000-3030	Cannulated Screw, 3.0mm x 30mm	
1000-3032	Cannulated Screw, 3.0mm x 32mm	
1000-3034	Cannulated Screw, 3.0mm x 34mm	
1000-3036 1000-3520	Cannulated Screw, 3.0mm x 36mm	
	Cannulated Screw, 3.5mm x 20mm	
1000-3522 1000-3524	Cannulated Screw, 3.5mm x 22mm Cannulated Screw, 3.5mm x 24mm	
1000-3524	Cannulated Screw, 3.5mm x 24mm	
1000-3528	Cannulated Screw, 3.5mm x 28mm	
1000-3528	Cannulated Screw, 3.5mm x 30mm	
1000-3530	Cannulated Screw, 3.5mm x 32mm	
1000-3532	Cannulated Screw, 3.5mm x 34mm	
1000-3534	Cannulated Screw, 3.5mm x 34mm	
1000-3538	Cannulated Screw, 3.5mm x 38mm	
1000-3540	Cannulated Screw, 3.5mm x 40mm	
1000-0035	Washer, 3.0/3.5	
Instruments		
1100-0110	Non-Threaded Guide Wire,	
1100 0110	1.1mm x 150mm	
1100-0160	Non Threaded Guide Wire,	
	1.6mm x 150mm	
1100-2200	Cannulated Drill Bit, Quick Connect,	
1100-2200	2.2mm x 115mm	
1100-2600	Cannulated Drill Bit, Quick Connect,	
1100 2000	2.6mm x 115mm	
1100 0000	Handle with Quick Connect	
1100-0000		
1100-0004	Small Ratchet Handle with Quick	
1100 000 1	Connect	
1100-0010	Cannulated Screwdriver, Size T10	
1100 0010	Samulated Sciewanven, Size i 10	
1100 0001	Constituted Double Collete	
1100-0001	Cannulated Depth Guide	
1100-3035	Cannulated Countersink, 3.0/3.5	
1100 0000		

CORETRAY (KIT-EP_CORE)

Implants

ппратто	
Catalog Number	Part Description
2000-2710 2000-2712 2000-2714 2000-2716 2000-2718 2000-2720 2000-2722 2000-2724 2000-2726 2000-2728 2000-2730	2.7 Locking Screw x 10mm 2.7 Locking Screw x 12mm 2.7 Locking Screw x 14mm 2.7 Locking Screw x 16mm 2.7 Locking Screw x 18mm 2.7 Locking Screw x 20mm 2.7 Locking Screw x 22mm 2.7 Locking Screw x 24mm 2.7 Locking Screw x 26mm 2.7 Locking Screw x 28mm 2.7 Locking Screw x 30mm
2001-2710-N 2001-2712-N	2.7 Non-Locking Screw x 10mm 2.7 Non-Locking Screw x 12mm
2001-2714-N	2.7 Non-Locking Screw x 14mm
2001-2716-N	2.7 Non-Locking Screw x 16mm
2001-2718-N	2.7 Non-Locking Screw x 18mm
2001-2720-N 2001-2722-N	2.7 Non-Locking Screw x 20mm
2001-2722-N 2001-2724-N	2.7 Non-Locking Screw x 22mm2.7 Non-Locking Screw x 24mm
2001-2724-N 2001-2726-N	2.7 Non-Locking Screw x 24mm
2001-2728-N	2.7 Non-Locking Screw x 28mm
2001-2730-N	2.7 Non-Locking Screw x 20mm
2001 2700 IV	2.7 Non Locking ociew x domin
2000-3510	3.5 Locking Screw x 10mm
2000-3512	3.5 Locking Screw x 12mm
2000-3514	3.5 Locking Screw x 14mm
2000-3516	3.5 Locking Screw x 16mm
2000-3518	3.5 Locking Screw x 18mm
2000-3520	3.5 Locking Screw x 20mm
2000-3522	3.5 Locking Screw x 22mm
2000-3524	3.5 Locking Screw x 24mm
2000-3526	3.5 Locking Screw x 26mm
2000-3528	3.5 Locking Screw x 28mm
2000-3530	3.5 Locking Screw x 30mm
2000-3532	3.5 Locking Screw x 32mm
2000-3534 2000-3536	3.5 Locking Screw x 34mm 3.5 Locking Screw x 36mm
2000-3538	3.5 Locking Screw x 38mm
2000-3540	3.5 Locking Screw x 40mm
2000-3545	3.5 Locking Screw x 45mm
2000-3550	3.5 Locking Screw x 50mm
2000 0000	5.5 Looking Golovy A Gollini







2001-3510-N	3.5 Non-Locking Screw x 10mm
2001-3512-N	3.5 Non-Locking Screw x 12mm
2001-3514-N	3.5 Non-Locking Screw x 14mm
2001-3516-N	3.5 Non-Locking Screw x 16mm
2001-3518-N	3.5 Non-Locking Screw x 18mm
2001-3520-N	3.5 Non-Locking Screw x 20mm
2001-3522-N	3.5 Non-Locking Screw x 22mm
2001-3524-N	3.5 Non-Locking Screw x 24mm
2001-3526-N	3.5 Non-Locking Screw x 26mm
2001-3528-N	3.5 Non-Locking Screw x 28mm
2001-3530-N	3.5 Non-Locking Screw x 30mm
2001-3532-N	3.5 Non-Locking Screw x 32mm
2001-3534-N	3.5 Non-Locking Screw x 34mm
2001-3536-N	3.5 Non-Locking Screw x 36mm
2001-3538-N	3.5 Non-Locking Screw x 38mm
2001-3540-N	3.5 Non-Locking Screw x 40mm
2001-3545-N	3.5 Non-Locking Screw x 45mm
2001-3550-N	3.5 Non-Locking Screw x 50mm



Instruments

Catalog Number Part Description

1100-0160 Guidewire, 1.6mm x 150mm

2100-0160 1.6 Olive Pin

1100-0000 Handle with Quick Connect 1100-0004 Ratchet Handle, Small

2100-0001 Solid Depth Guide

2100-0002 Locking Drill Guide

2100-0015 Solid Screwdriver, Size T15

2100-2000 2.0mm Solid Drill Bit

2100-2027 2.0/2.7 Double-Ended Drill Guide

2100-2700 2.7mm Solid Drill Bit



GREAT TOE ARTHRITIS INSERT (KIT-EP_GT)

Implants

Catalog NumberPart Description2000-1000Small MTPJ Plate2000-1001MTPJ Plate2000-1002Small Slotted MTPJ Plate2000-1003Slotted MTPJ Plate

Instruments





2100-1016	16mm Cup Reamer
2100-1017	16mm Cone Reamer
2100-1018	18mm Cup Reamer
2100-1019	18mm Cone Reamer
2100-1020	20mm Cup Reamer
2100-1021	20mm Cone Reamer
2100-1022	22mm Cup Reamer
2100-1023	22mm Cone Reamer
2100-1015	Custom MTPJ Retractor



HALLUX VALGUS (KIT-EP_HV)			
Implants			
Catalog Number	Part Description		
2000-2000 2000-2002 2000-2003 2000-2004 2000-2005	Opening Wedge Plate, 0 Opening Wedge Plate, 2 Opening Wedge Plate, 3 Opening Wedge Plate, 4 Opening Wedge Plate, 5		
2000-3000 2000-3002 2000-3003 2000-3004 2000-3005	Butterfly Plate, 0 Butterfly Plate, 2 Butterfly Plate, 3 Butterfly Plate, 4 Butterfly Plate, 5		
2000-4000	Lapidus Plate		
3000-1010	Akin Staple 10 x 10		
4000-0011 4000-0012 4000-0013 4000-0014	2.0 Snap-Off Screw x 11 2.0 Snap-Off Screw x 12 2.0 Snap-Off Screw x 13 2.0 Snap-Off Screw x 14		
Instruments			
2100-2009	Spreader		
3100-0000	Akin Staple Instrument		
4100-0001	Snap-Off Driver		





MIDFOOT/FLATFOOT (KIT-EP_MF)

Implants

Catalog Number Part Description

2000-5000 Straight Plate

2000-5001 Offset Plate

2000-5002 **Extended Butterfly**

2000-6000 Xplate, 30mm Xplate, 33mm 2000-6001 Xplate, 36mm 2000-6002

Double Xplate, 60mm 2000-6003

2000-6004 Double Xplate, 67mm











ANKLE FRATURE (KIT-EP_AFX)

Implants

Catalog Number	Part Description
2000-2710	2.7 Locking Screw x 10mm
2000-2712 2000-2714	2.7 Locking Screw x 12mm2.7 Locking Screw x 14mm
2000-2716	2.7 Locking Screw x 16mm
2000-3510	3.5 Locking Screwx 10mm
2000-3512	3.5 Locking Screw x 12mm
2000-3514 2000-3516	3.5 Locking Screw x 14mm 3.5 Locking Screw x 16mm

2000-7001 Medial Tab Plate

2000-7002	Medial Hook Plate

2000-7003	UnivLat Fib Plate - STD
2000-7004	Univ Lat Fib Plate - Lg
2000-7005	Univ Lat Fib Plate - XL
2000-7006	Right Lat Fib Plate - Std
2000-7007	Right Lat Fib Plate - Long
2000-7008	Right Lat Fib Plate - XLong
2000-7009	Left Lat Fib Plate - STD
2000-7010	Left Lat Fib Plate - Long
2000-7011	Left Lat Fib Plate - Xlong
2000-7012	Posterior Plate - Std
2000-7013	Posterior Plate, Long











2000-7014 2000-7015 2000-7016 2000-7017 2000-7018	Straight Plate - 6 Hole Straight Plate - 8 Hole Straight Plate - 10 Hole Straight Plate - 12 Hole Straight Plate -14 Hole	
2000-7019 2000-7020 2000-7021 2000-7022 2000-7023	UnivRecon Plate - 9 Hole UnivRecon Plate - 11 Hole UnivRecon Plate - 13 Hole UnivRecon Plate - 15 Hole UnivRecon Plate - 17 Hole	
2000-7024 2000-7025 2000-7026 2000-7027 2000-7028	Straight Plate Contrd - 6 Hole Straight Plate Contrd - 8 Hole Straight Plate Contrd - 10 Hole Straight Plate Contrd - 12 Hole Straight Plate Contrd - 14 Hole	
2000-7029	Syndesmosis Plate	
2001-4045 2001-4050 2001-4055 2001-4060	4.0 No-Lock Screw x 45mm 4.0 No-Lock Screw x 50mm 4.0 No-Lock Screw x 55mm 4.0 No-Lock Screw x 60mm)
Instruments		
2100-7000	Impactor, Hook Plate	
2100-7001	Hook Plate Drill Guide	

INDICATIONS FOR USE

INDICATIONS FOR USE

The EPIC Extremity fracture module is indicated for use in stabilization of fresh fractures, revision procedures, joint fusion, and reconstruction of small bones of the hand, feet, wrist, ankles, fingers, and toes. The system can be used in both adult and pediatric patients. The plates/screws are intended for single-use only.

CONTRAINDICATIONS FOR USE

- Patients where there is an active infection
- Possibility for conservative treatment
- Patients with malignant primary or metastasis tumors which preclude adequate bone support or screw fixations, unless supplemental fixation or stabilization methods are utilized.
- Growing patients with open epiphyses
- Insufficient quantity or quality of bone to permit stabilization of the arthrodesis
- Suspected or documented metal allergy or intolerance

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